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The Effect of Succinylcholine Chloride on the Heart of the Horse: Clinical and Pathological Aspects*

BY

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SUMMARY.—An account is given of observations made on 52 horses that were cast with intravenous succinylcholine chloride. Thirty-nine were clinical cases and of these 24 were sedated prior to casting. Examinations were made of the hearts of 13 horses that were killed after casting with succinylcholine chloride. The hearts of 30 horses which did not receive the relaxant were examined as controls.

Introduction

THE use of succinylcholine chloride as a casting agent in the horse has been reported widely in North America (Stowe, 1955; Belling & Booth, 1955), Scandinavia (Hansson, 1954, 1956, 1957), Australia (Larsen, 1958), and quite recently by Neal and Wright (1959) in this country. These reports show that this method of casting horses has definite advantages over conventional methods such as hobbles or sidelines. However, the effect of succinylcholine chloride on the heart of the horse would indicate that further studies on its action are necessary. Neal and Wright reported a marked tachycardia in 17 out of 20 cases in which it was used, and the author (Tavernor, 1959) recorded one death in 28 cases. In South Africa, Lock and Harthoorn (1959) report the use of succinylcholine chloride in the zebra and record one fatality attributed to cardiac arrest. Larsen *et al.* (1959) observed endocardial haemorrhages in the hearts of 10 out of 15 horses which were killed immediately after they had been cast by succinylcholine chloride.

* Paper presented to the Annual Conference of the Association of Veterinary Teachers and Research Workers in Bristol, March 29th to 31st, 1960.

The material reviewed here consisted of 39 unselected cases presented for a wide variety of examinations and surgery, on which clinical observations of heart action were made. Thirteen other horses were killed shortly after casting with succinylcholine chloride; their hearts were examined *post mortem*, and compared with the hearts of 30 horses which did not receive succinylcholine chloride.

Clinical Observations

The first 15 of these cases receiving dose rates between 0.15 and 0.24 mg. per kg. showed the same marked tachycardia and arrythmias as described by Neal and Wright. The average increase in heart rate was fourfold and in 7, marked arrythmias were noted. Apnoea was present in 9 and varied in duration from 20 to 90 seconds. Details of these cases are shown in Table I.

There was one fatality. This was a 22-year-old riding horse gelding of 430 kg. live-weight. The horse died from primary cardiac arrest 2½ minutes after the intravenous injection of 85 mg. (0.2 mg. per kg. bodyweight) of suecinylcholine chloride. The heart rate rose from 28 per minute at rest to 188 per minute 90 seconds after the injection. At 2½ minutes the heart could not be heard with a stethoscope and artificial respirations were commenced although spontaneous respirations were still observed until 5 minutes after the injection. There was no period of apnoea and spasmodic movements of the limbs were observed during the first 2½ minutes. *Post-mortem* examination showed the presence of a severe fatty change in the heart muscle. No endocardial haemorrhages were found.

TABLE I
HORSES CAST WITH SUCCINYLCHOLINE CHLORIDE. NO SEDATION

Case number	Description	Weight, kg.	Dose rate of relaxant mg. per kg.	Heart rate per minute		Duration of apnoea, seconds
				Normal	Highest recorded	
1	8-year-old hunter gelding	610	0·22	48	160	30
2	3- „ pony gelding	305	0·165	72	160	40
3	4- „ „	407	0·15	48	80	60
4	17- „ hunter mare	460	0·22	64	140	30
5	8- „ „	509	0·15	34	168	25
6	7- „ pony gelding	305	0·18	54	—	—
7	8- „ hunter gelding	560	0·23	34	160	90
8	8- „ hunter mare	522	0·20	36	160	20
9	Yearling Arab colt (¼ gr. atropine 10 minutes before casting)	356	0·15	36	204	None
10	14-year-old cob gelding	485	0·20	40	190	„
11	8- „ hunter mare	509	0·24	36	168	65
12	8- „ „	509	0·24	36	144	65
13	22- „ riding horse gelding (horse died) ...	430	0·20	28	188	None
14	9- „ hunter gelding	560	0·20	34	164	20
15	9- „ „	485	0·20	36	—	—

After the above episode, it was decided to sedate a number of patients before giving them succinylcholine chloride and to observe the effect on the heart and respiratory rates. Thirteen horses were given trimeprazine tartrate; 5 promazine hydrochloride; 4 chlorpromazine hydrochloride; and 1 chloral hydrate. One horse received thiopentone sodium and succinylcholine chloride simultaneously. Details of these cases are shown in Table II.

Thirteen horses were given between 1.0 and 1.5 mg. per kg. of trimeprazine tartrate intravenously 30 minutes prior to 0.2 mg. per kg. of the relaxant. All exhibited marked signs of sedation. After they had fallen to the ground a 3- to 6-fold increase in heart rate was shown in 10 and arrythmias were recorded in 3. Apnoea of 60 seconds average duration occurred in 9. Respiration rates increased threefold following this period of apnoea.

Five horses were given between 1.1 and 1.4 mg. per kg. of promazine hydrochloride intravenously 15 minutes prior to 0.2 mg. per kg. bodyweight of succinylcholine chloride. Three patients showed a

TABLE II
HORSES SEDATED PRIOR TO CASTING WITH SUCCINYLCHOLINE CHLORIDE

Case number	Description	Weight, kg.	Dose rate of relaxant mg. per kg.	Sedative agent and dose rate, mg. per kg.	Heart rate per minute		Duration of apnoea, seconds
					Normal	Highest recorded	
16	5-year-old hunter mare	485	0·2	Trimeprazine tartrate 1·0	36	60	None
17	24- „ „	381	0·2	„ 1·2	—	—	„
18	3- „ „	509	0·2	„ 1·1	30	164	60
19	3- „ pony gelding ...	215	0·2	„ 1·2	35	45	60
20	Aged riding horse mare	356	0·2	„ 1·4	48	148	60
21	9-year-old hunter gelding ...	660	0·2	„ 1·1	36	156	80
22	3- „ thoroughbred colt ...	460	0·2	„ 1·1	32	176	65
23	6- „ pony mare	330	0·2	„ 1·5	32	172	None
24	8- „ polo pony mare ...	460	0·2	„ 1·1	36	184	80
25	10- „ hunter mare	485	0·2	„ 1·0	28	176	70
26	5- „ „	473	0·2	„ 1·1	36	180	60
27	3- „ thoroughbred colt ...	509	0·2	„ 1·0	40	120	None
28	4- „ „ stallion	432	0·2	„ 1·1	36	160	30
29	Aged pony mare	473	0·2	Promazine HCl 1·1	32	120	None
30	15-year-old hunter mare	432	0·2	„ 1·1	70	96	„
31	10- „ pony mare	292	0·2	„ 1·3	40	150	„
32	Aged pony gelding	356	0·2	„ 1·4	44 (Heart stopped)	70	Two short periods
33	10-year-old pony mare	292	0·2	„ 1·3	40	180	None
34	7- „ pony gelding ...	305	0·15	Chlopromazine HCl 1·6	34	50	„
35	8- „ hunter gelding ...	560	0·2	„ 1·8	25	120	„
36	12- „ hunter mare	635	0·2	„ 1·6	36	150	„
37	3- „ „	381	0·2	„ 1·7	40	120	„
38	3- „ pony colt	275 (estimated)	0·2	Chloral hydrate 54	—	—	—
39	10- „ hunter mare	460	0·15	5 gm. thiopentone ¾ gr. atropine —	34	168	120

W. D. TAVERNOR—THE EFFECT OF SUCCINYLCHOLINE CHLORIDE ON THE HEART OF THE HORSE

FIG. 1. (left)—Ecchymosis in right ventricle (conus arteriosus) of Case No. 41, showing marked extravasation of blood into myocardium. H. & E. × 125.

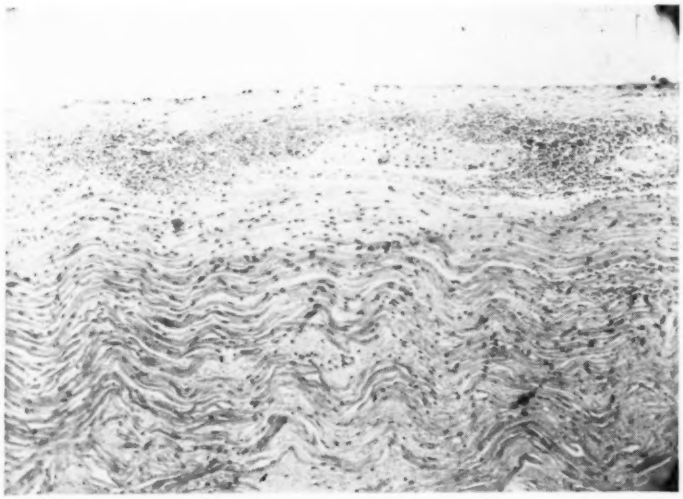

FIG. 2.—Extravasation of blood into myocardium and sub-endocardial haemorrhage in right auricle of Case No. 43. H. & E. × 125.

FIG. 3. (left)—As in Fig. 2 × 440.

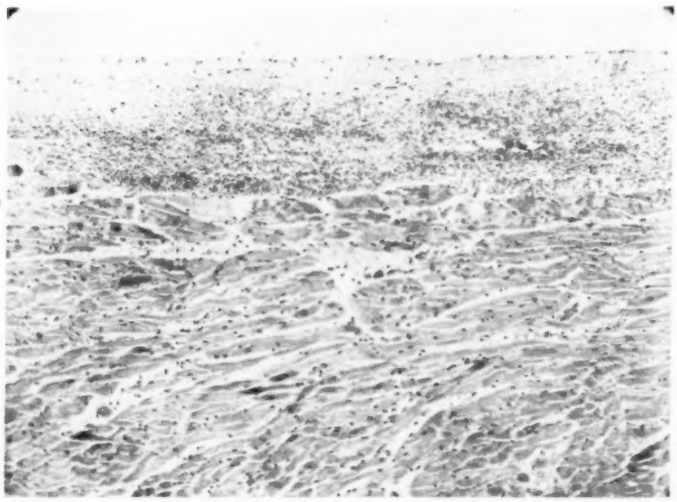

FIG. 4.—Extravasation of blood into myocardium and sub-endocardial haemorrhage in right ventricle (conus arteriosus) of Case No. 44. Section of so-called "wire-brush" haemorrhage. H. & E. × 125.

fourfold increase in heart rate and arrythmias were noted in 2. Apnoea was recorded in only 1 and was of short duration. One animal, an aged pony gelding weighing 356 kg., whose heart rate rose from 44 per minute before casting to 70 per minute afterwards, gave cause for anxiety. Three minutes after administration of 70 mg. (0.2 mg. per kg.) succinylcholine chloride the heart stopped beating. After a further period of 90 seconds the heart beat recommenced. Artificial respirations were given as a precaution, but spontaneous respirations never ceased. The horse made a normal recovery.

Four horses were given between 1.6 and 1.8 mg. per kg. of chlorpromazine intramuscularly an hour before casting. Three of these animals showed a marked increase in heart rate but no arrythmias or apnoea were observed.

One horse presented for castration was unmanageable. Sedation was accomplished by giving chloral hydrate in the drinking water. Twenty minutes later the horse was quiet and a 0.2 mg. per kg. dose of succinylcholine chloride was administered intravenously with ease. The horse went down quietly and was restrained. It was not possible to make detailed observations but there was no apnoea or marked increase in heart rate.

Intravenous thiopentone sodium and succinylcholine chloride were given simultaneously to one horse which had been premedicated with atropine sulphate. The horse fell to the ground 30 seconds later and a 2-minute period of apnoea ensued. The heart rate increased 5-fold but there were no arrythmias.

Pathological Observations

Horses were obtained from two sources. Three were horses destroyed by shooting and 10 were serum production horses killed by bleeding out. These animals were cast by intravenous injection of succinylcholine chloride at rates of 0.2 and 0.3 mg. per kg. and were destroyed 11 to 48 minutes later. Detailed observations were made on heart and respiratory rates and the hearts were examined after death. Details of the observations are shown in Table III. Where endocardial haemorrhages were observed, histological sections were prepared. Hearts from horses in both categories, but which did not receive succinylcholine chloride were examined as controls.

TABLE III
HORSES DESTROYED AFTER CASTING WITH SUCCINYLCHOLINE CHLORIDE

Case number	Description	Estimated weight, kg.	Dose rate of relaxant mg. per kg.	Heart rate per minute		Duration of apnoea, seconds	Death minutes after casting	*Post mortem*
				Normal	Highest recorded			
40	10-year-old hunter gelding ...	450	0·2	35	104	120	25 shot)	Haemorrhages in both ventricles
41	4- „ thoroughbred gelding	350	0·2	28	48	None	11 („)	Ditto
42	12- „ pony mare	338	0·2	46	200	„	13 („)	Ditto
43	16- „ hunter type gelding	450	0·2	56	160	„	29 (bleeding)	Ditto
44	Aged hunter type gelding ...	450	0·2	52	92	„	33 („)	Slight haemorrhages in right ventricle
45	„ „ mare	450	0·2	40	160	60	39 („)	Ditto
46	„ cob mare	400	0·3	48	96	60	48 („)	Haemorrhages under bicuspid valve
47	„ cob gelding (½ gr. atropine 20 minutes prior to casting)	450	0·2	52	160	None	27 („)	Haemorrhages in right ventricle
48	Aged hunter type mare	450	0·3	50	168	70	31 („)	Ditto
49	„ „ „	450	0·3	52	172	40	25 („)	Haemorrhages in both ventricles
50	„ „ „	400	0·3	34	160	120	30 („)	Negative
51	„ „ „	500	0·2	48	136	None	37 („)	Haemorrhages in both ventricles
52	14-year-old cob gelding	350	0·2	—	—	—	Bleeding	Negative

Of the 3 horses that were cast with the relaxant and then shot, 2 showed a marked increase in heart rate and arrythmias. The heart rate of the third remaining steady. There was a 65-second apnoea in one. The hearts of all 3 showed sub-endocardial haemorrhages. The lesions consisted of eccymoses and " wire-brush " type haemorrhages (Larsen, 1959), and were most marked in the right ventricles, especially below the cusps of the tricuspid valve and in the conus arteriosus. Histological examination of these lesions showed extravasation of red blood cells between the bundles of cardiac muscle and in the subserosa (see Fig. 1). The hearts of a control group of 10 horses shot in the normal manner showed no lesions.

The second group consisted of 10 serum horses that were cast with succinylcholine chloride prior to bleeding out. These horses were of hunter type and their average weight was 450 kg. After casting, the limbs were secured and a mixture of chloroform and ether administered in a mask. The carotid was exposed and cannulated and the horse bled out.

Two dose rates were used. Six horses received 0.2 mg. per kg. bodyweight succinylcholine chloride and one of these was premedicated with atropine sulphate. All these animals showed an increase in heart rate, the average increase being three-fold. Arrythmias were noted in two and apnoea of 60 seconds' duration in one. The atropine had no apparent effect on the heart rate. Five of these ani-

mals showed endocardial lesions. Two showed only slight "wire-brush" type haemorrhages, the other 3 showing marked haemorrhages and eccymoses (see Figs. 2 to 4). One animal showed no lesions.

A dose of 0.3 mg. per kg. was given to 4 horses. Again the increase in heart rate was threefold and arrythmias were noted in 3. Apnoea from 40 to 120 seconds' duration was observed in all 4. Three hearts showed endocardial haemorrhages.

Examination of the hearts of 20 horses bled out in the same manner, but cast by ropes and hobbles, showed the presence of sub-endocardial haemorrhages in 14.

A further 3 horses were cast by a 5-gm. dose of thiopentone sodium given intravenously prior to bleeding out. *Post-mortem* examination of these hearts showed very slight endocardial haemorrhages in one.

Discussion

The reported observations cover 52 horses apart from controls. The findings in the clinical cases agree very closely with those of Neal and Wright and it is obviously inadvisable to use succinylcholine chloride in horses with heart disease. It would appear that sedation with the agents used has little action on the cardiac and respiratory effects of the drug, but makes the casting quieter. During recumbency the animal lies quietly under the effect of the sedative and superficial examinations are facilitated.

There is some difficulty in the interpretation of the pathological findings. The demonstration of endocardial haemorrhages by the author following the intravenous use of succinylcholine chloride supports the findings of Larsen. It is interesting, however, to observe that similar haemorrhages are found in the hearts of horses killed by bleeding. It may well be that these haemorrhages are associated with the agonal type of death. The significance of this type of haemorrhage on cardiac function of horses cast by succinylcholine chloride and subjected to clinical examination or operation is not easy to assess. Larsen mentions reports from trainers in Australia that there was loss of racing form in animals castrated under the influence of this agent; no mention is made of anaesthesia employed, if any. It is reasonable to assume that haemorrhages of this type restricted to the heart of a healthy horse would very quickly resolve. If the animal has any cardiac defect it is more probable that the great increase in heart rate and arrythmias would be the factors giving rise to serious complications and possibly death.

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Clinical Note

Traumatic Cleft Palate in the Cat

Leonard R. Geffen
Kingston, Jamaica

THE patient in this instance was a 14-month-old black and white cat of indiscriminate breeding.

History: The cat was brought to the J.S.P.C.A. clinic at Mandeville. The owner stated that his cat was always snuffling and sneezing, ever since being hit on the head by a car.

On examination it was found that the cat was suffering from a severely cleft palate, the cleft extending from about half an inch behind the incisor teeth to the soft palate. Anteriorly it was a fine "line" cleft, but posteriorly the cleft gaped about a third of an inch wide for about half an inch of its length. Food passing into the nasal passages through this cleft was responsible for the snuffling and sneezing. At the owner's insistence, it was decided to operate.

Procedure: The animal was anaesthetised with intravenous pentobarbitone sodium* restrained on its back, and the mouth kept open with a Hamilton Kirk gag.

The first stage of the operation consisted in carefully dissecting the soft tissues and membrane of the roof of the mouth off the palatine bones. Once this was free, an incision was made in an antero-posterior line on either side of the cleft, in order to relieve tension and give more tissue with which to "play." The edges of the cleft were freshened until they were bleeding freely, and then a row of nylon sutures was inserted; a second row of retention sutures, 4 in all at a distance apart of an eighth of an inch, was then inserted. It was hoped that the cat would not interfere with the sutures with its tongue.

A week later the cat was brought to the clinic. All the sutures were in place except the most posterior one and this had come out. The wound was slightly open. The animal was re-anaesthetised and a retention suture was inserted.

One week later, the animal was re-anaesthetised and the sutures removed. Later in the day it was observed that the palate had healed completely and the animal was not snuffling or sneezing.

The lateral wounds that had been made to reduce the tension at the first operation healed within a few days.

* "Sagatal," May & Baker Ltd.

Anthelmintic Treatment of the Smaller Abomasal Trichostrongyles of Sheep

BY

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SUMMARY.—1.—The anthelmintic efficiency of 2 phenothiazine preparations, 0, 0-dimethylhydroxy-2, 2, 2-trichlorophosphonate (Bayer L13/59), 3-chloro-4-methyl-7-oxycoumarine diethyl thiophosphoric acid (Bayer 21/199), bephenium embonate and bephenium hydroxynaphthoate against Ostertagia *spp. and* T. axei *were studied in the course of 2 controlled experiments using naturally infested sheep.*

2.—Two phenothiazine preparations of similar particle size gave significantly different anthelmintic efficiencies. The more active preparation was highly efficient against the adults of both parasites and moderately effective against immature Ostertagia *spp.*

3.—The anthelmintic efficiency of the 2 phenothiazine preparations was significantly higher when the drug was injected into the rumen than when drenched into the abomasum after swabbing the mouth with 10 per cent. $CuSO_4$ solution. A possible explanation of this is suggested.

4.—The organic phosphorus anthelmintics Bayer L13/59 and Bayer 21/199 were ineffective when administered by injection into the rumen. When given orally after swabbing the pharynx with 10 per cent. $CuSO_4$ Bayer L13/59 was highly effective against adult Ostertagia *spp. and* T. axei *and highly effective against immature* Ostertagia *spp.*

5.—Bephenium embonate was ineffective against either parasite whether the drug was directed into the rumen or into the abomasum. By contrast bephenium hydroxynaphthoate was moderately effective against immature Ostertagia *spp. and against* T. axei *by ruminal injection but ineffective against adult* Ostertagia *spp. by this route. When given orally after swabbing the mouth cavity with $CuSO_4$ solution bephenium hydroxynaphthoate was highly effective against all stages of* Ostertagia *spp. and against adult* T. axei.

Introduction

FOR many years phenothiazine has been accepted as the anthelmintic of choice for treating gastro-intestinal trichostrongyles and strongyles in sheep. Its efficiency against *Haemonchus contortus* and *Oesophagostomum columbianum* is well established but for some time there have been doubts concerning its efficiency against the smaller trichostrongyles especially the abomasal parasites *Ostertagia circumcincta*, *Ostertagia trifurcata* and *Trichostrongylus axei*. These doubts were partially resolved by the demonstration of the importance of particle size in determining the efficiency of phenothiazine against these small parasites (Gordon, 1956, Whitten, 1956, Douglas, Baker & Longhurst, 1956). Thomas and Elliott (1957) and later Kingsbury (1958) presented evidence indicating that an ideal "all purpose" phenothiazine preparation may comprise 70 per cent. particles $<5\mu$ in diameter, or 90 per cent. $<10\mu$ in diameter and with the remaining particles ranging up to 30μ in diameter. This may be expected to give a range of particle sizes which will be effective against each of the common intestinal nematodes of sheep excepting *Bunostomum trigonocephalum* and possibly *Nematodirus* spp.

More recently Douglas, Baker and Longhurst (1959) and Baker, Allen, Longhurst and Douglas (1959) demonstrated the importance of purity of the phenothiazine preparation. They showed that purified phenothiazine of $6{\cdot}6\mu$ mean particle diameter was comparable to U.S. National Formulary phenothiazine of $2{\cdot}6\mu$. Furthermore, the efficiency of purified phenothiazine was only slightly reduced when mean particle diameter increased to $14{\cdot}4\mu$ although the efficiency of N.F. phenothiazine was very markedly reduced at 10μ. These tests were carried out on sheep with mixed trichostrongyle infestations (mainly *Ostertagia* spp. and *Trichostrongylus* spp.) in sheep and on mice infested with *Nematospiroides dubius*.

Work in Australia by Forsyth (1960) has confirmed the importance of purity and it was claimed that a minimum of 85 to 90 per cent. is necessary to obtain high efficiency against the genera *Ostertagia* and *Trichostrongylus*. Forsyth also proposed that dosage should be expressed in terms of total dose area (*i.e.* dose weight in gm × specific surface area per gm). It appeared to matter little whether the total surface area of a dose was attained by a larger dose of coarse material or a smaller dose of fine material, although he suggested without quoting figures, that fineness may have a specific importance when treatment is directed against *Ostertagia* spp. At any dosage level efficiency tended to increase directly with purity up to about 90 per cent. beyond which any increase in purity was of little therapeutic value.

In view of the studies quoted above it would appear that adverse criticism of the efficacy of phenothiazine against *Ostertagia* spp. and *T. axei* may have arisen due to a lack of complete knowledge of the physical properties and chemical purity of the material used. Before the full implications of this new data concerning phenothiazine can be realised it is essential that tests for particle size and more especially for purity of the material should be standardised. Without this, results of studies with different phenothiazine preparations must be treated with some reservations.

In recent years a number of organic phosphorus

compounds, originally introduced as systemic insecticides have achieved prominence as anthelmintics. The chief of these are 0, 0-dimethylhydroxy-2, 2, 2-trichlorophosphonate (Bayer L13/59, Neguvon, Dipterex), 3-chloro-4-methyl-7-oxycoumarine diethyl thiophosphoric acid (Bayer 21/199, Muscatox, Asuntol), 0, 0-dimethyl-0-2, 4, 5-trichlorophenyl phosphorothioate (Dow ET-57, Trolene, Viozene) and 4-tertiary-butyl-2-chlorophenyl methyl methylphosphoramidate (Dowco 132, Ruelene, Montrel). Riek and Keith (1958) recorded a high efficiency for Bayer L13/59 against *T. axei* in calves. *Ostertagia ostertagi* was not present in their calves. Gordon (1958a) could not confirm that Bayer L13/59 introduced into the rumen of sheep was effective against *T. axei*. He also considered that Bayer 21/199 was too toxic for general use in sheep while Dow ET-57 was valueless against the smaller abomasal trichostrongyles. Riek (1958) found that Bayer 21/199 and Dow ET-57 were ineffective against *T. axei* in calves.

In the U.S.A. Herlich and Porter (1958) claimed that Bayer 21/199 was effective against both *T. axei* and *Ostertagia* spp. in sheep and noted only slight and transitory toxic effects. This result was obtained without any attempt to induce closure of the oesophageal groove and thereby secure passage of the material directly to the abomasum. With regard to Dow ET-57 Schad, Allen and Samson (1958) disagreed with an earlier report by Crenshaw (1956) who claimed that this compound was effective against *Ostertagia* spp. in cattle. This is in agreement with Gordon's (1958a) conclusions regarding this material as an ovine anthelmintic.

Anthelmintic studies on the organic phosphorus compounds have also been carried out in South Africa. Stampa (1959) claimed that Bayer 21/199 was very effective against both *Ostertagia* spp. and *Trichostrongylus* spp. in sheep and that efficiency was not dependent on the oesophageal groove reflex. Bayer L13/59 was not effective against these parasites, although a mixture of 10 parts L13/59 and 1 part 21/199 was claimed to be similar in effect to 21/199 alone. Reinecke and Schutte (1959) carried out more extensive trials with calves. *O. ostertagi* was not present in their calves but the mixture used by Stampa (1959) appeared to be highly efficient against *T. axei*.

The only published studies of the anthelmintic efficiency of Dowco 132 is that of Douglas and Baker (1959). They concluded that by oral dosing this drug was highly efficient against both *Ostertagia* spp. and *T. axei*.

Among new anthelmintics series introduced in recent years are the bephenium salts, first used by Copp, Standen, Scarnell, Rawes and Burrows (1958) and by Scarnell and Rawes (1959) especially against *Nematodirus* spp. Rawes and Scarnell (1959) have since given evidence of anthelmintic efficiency of bephenium hydroxynaphthoate against *H. contortus*, *Ostertagia* spp., *T. axei* and *Cooperia curticei*. They indicated that very varying results were obtained in sheep in tests of this compound against gastro-intestinal nematodes (other than *Nematodirus* spp.) Bephenium hydroxynaphthoate is the salt currently being marketed, surpassing in efficiency and hence replacing the earlier bephenium embonate.

It must always be borne in mind that an anthelmintic which is to be used on a large scale for ruminants must be effective when given by orthodox drenching techniques without premedication with copper sulphate. That is it must be efficient when swallowed into the rumen, whereby obviating the need for special methods which attempt to ensure direct passage into the abomasum.

Materials and Methods

Two separate controlled trials were carried out both with naturally infested sheep averaging 30 lb. bodyweight in Trial 1 and 40 lb. in Trial 2. In both trials the sheep were infested not only with *Ostertagia* spp. and *T. axei* but also with other gastro-intestinal nematodes, including *Haemonchus contortus*. intestinal *Trichostrongylus* spp., *Nematodirus* spp., *Oesophagostomum columbianum*, *Oesophagostomum venulosum* and *Chabertia ovina*. *Dictyocaulus filaria* was present in lambs in Trial 1. However, the purpose of this paper is solely to report the results of various anthelmintic treatments against infestations by *Ostertagia* spp. and *T. axei* in the abomasum.

In Trial 1 a comparison was made of the anthelmintic efficiency of "micronised" phenothiazine, Bayer L13/59 and bephenium embonate. Each of these preparations was administered to separate groups of sheep either by intra-ruminal injection *via* the flank or by a direct oral drench given about 10 seconds after swabbing the pharynx with 10 per cent. $CuSO_4$ solution to stimulate closure of the oesophageal groove and ensure passage of the drug directly to the abomasum.

In Trial 2 a comparison was made of 2 commercial phenothiazine preparations manufactured in Australia, bephenium hydroxynaphthoate, Bayer L13/59 and Bayer 21/199. The phenothiazine and bephenium preparations were again administered both by ruminal injection and by mouth after preswabbing with $CuSO_4$. Bayer L13/59 had been shown in Trial 1 to be ineffective if given into the rumen and in Trial 2 it was given orally after preswabbing with $CuSO_4$. Bayer 21/199 was injected intra-ruminally.

The particle sizes given by the manufacturers of the phenothiazine preparations used in Trial 2 were 18,000 cm^2/gm for preparation A and 18,700 cm^2/gm for preparation B. Both were in the form of a wettable powder. No information was available regarding the purity of the preparations. The phenothiazine used in Trial 1 was identical with phenothiazine A.

The sheep which received the organic phosphorus compounds were individually weighed to ensure accuracy of dosing. The dose of phenothiazine and of the bephenium salts remained constant for all sheep, and were administered after suspending in approximately 30 ml water.

The doses used were as follows :—

Phenothiazine	15 gm. per animal
Bephenium salt	5 gm. per animal
Bayer L13/59	5 gm. per 100 lb. bodyweight
Bayer 21/199	0·3 gm. per 100 lb. bodyweight

The change in the bephenium salt from the embonate in Trial 1 to the hydroxynaphthoate in Trial 2 followed a change in the manufacturing policy by the makers. It was also indicated because of the lack of efficacy shown by the embonate in Trial 1. Rawes and Scarnell (1959) cited work indicating the greater activity of the hydroxynaphthoate against a number of nematodes.

Untreated control sheep were killed 24 to 48 hours after administering the drugs to the treated sheep which were killed 5 to 6 days after treatment. During this interval they were maintained on the pasture where they had been held during the preceding 2 weeks. Autopsy took place within 24 to 48 hours of removal from pasture.

All sheep were killed by cutting the throat. At autopsy the abomasum was carefully removed, slit open and the mucosa thoroughly scrubbed and washed. It was then subjected to overnight digestion in 1 per cent. pepsin and 1 per cent. HCl. at 37°C. The following day digest and washings were pooled and preserved with 3 per cent. formalin. The volume was adjusted to 2,000 ml. and all worms present in each of five 10 ml. aliquots were counted and differentiated. Counting was carried out under 10 × and 30 × magnification with a stereomicroscope.

TABLE I
TRIAL 1. THE NUMBER OF ADULT *Ostertagia* SPP. AND *Trichostrongylus axei* PRESENT AT AUTOPSY

Treatment applied	Number in group	*Ostertagia* spp.			*Trichostrongylus axei*		
		Number of worms		Efficacy per cent.	Number of worms		Efficacy per cent.
		Mean	S.E.		Mean	S.E.	
Control group. No treatment	7	1,629	192		328	99	
" Micronised " phenothiazine Ruminal injection	5	355	131	78	29	21	91
" Micronised " phenothiazine Orally after $CuSO_4$ mouth swab	5	1,208	277	26	253	62	22
Bephenium embonate Ruminal injection	5	1,730	302	0	336	127	0
Bephenium embonate Orally after $CuSO_4$ mouth swab	5	1,533	588	0	206	89	37
Bayer L13/59 Ruminal injection	5	1,847	642	0	528	162	0
Bayer L13/59 Orally after $CuSO_4$ mouth swab	5	115	89	93	6	6	98

Results

The results obtained with adult worms are presented in Tables I and II. From these figures an assessment of the percentage efficiency of the anthelmintics has been made by comparing the residual worm burdens with the worm burdens of the controls.

An attempt was made in Trial 2 to obtain an indication of the degree of efficiency against immature *Ostertagia* spp. which are often claimed to be more resistant to anthelmintic treatment than the mature

TABLE II
TRIAL 2. THE NUMBER OF ADULT *Ostertagia* SPP. AND *Trichostrongylus axei* PRESENT AT AUTOPSY

Treatment applied	Number in group	*Ostertagia spp.*			*Trichostrongylus axei*		
		Number of worms		Efficacy per cent.	Number of worms		Efficacy per cent.
		Mean	S.E.		Mean	S.E.	
Control group. No treatment	7	4,784	1,120		2,314	569	
Phenothiazine A. Ruminal injection	10	699	263	85	62	41	97
Phenothiazine A. Orally after $CuSO_4$ mouth swab	10	1,993	765	58	635	193	72
Phenothiazine B. Ruminal injection	10	3,343	846	30	218	54	91
Phenothiazine B. Orally after $CuSO_4$ mouth swab	10	3,730	863	22	948	131	59
Bayer 21/199 Ruminal injection	5	6,070	1,072	0	346	150	85
Bayer L13/59 Orally after $CuSO_4$ mouth swab*	4	138	92	97	110	54	95
Bephenium hydroxynaphthoate Ruminal injection	5	6,574	1,985	0	646	251	72
Bephenium hydroxynaphthoate Orally after $CuSO_4$ mouth swab	5	69	46	98	0	0	100

* In addition one sheep was accidentally treated orally without pre-swabbing with $CuSO_4$ solution. At autopsy this sheep had 1,180 *Ostertagia* spp. and 1,760 *T. axei*.

parasites. In view of the nature of the trial, during which the lambs were heavily stocked on pasture for almost 3 weeks, and remembering that control animals were killed 4 to 5 days earlier than the treated sheep, some reluctance may be felt to accepting the accuracy of the results for the immature parasites. However, since any error that may occur from these causes would in fact reduce the anthelmintic efficiency indicated, and since the trial groups themselves are strictly comparable, the results are presented in Table III.

TABLE III

TRIAL 2. THE NUMBERS OF IMMATURE 5TH STAGE AND 4TH STAGE *Ostertagia* SPP. PRESENT AT AUTOPSY

Treatment applied	Number in group	Immature 5th stage			4th stage		
		Number of worms		Efficacy per cent.	Number of worms		Efficacy per cent.
		Mean	S.E.		Mean	S.E.	
Control group. No treatment	7	1,216	143		261	64	
Phenothiazine A. Ruminal injection	10	183	44	85	85	26	67
Phenothiazine A. Orally after $CuSO_4$ mouth swab	10	204	54	83	64	20	75
Phenothiazine B. Ruminal injection	10	296	64	76	144	41	45
Phenothiazine B . Orally after $CuSO_4$ mouth swab	9	209	47	83	104	50	60
Bayer 21/199 Rumen injection	5	286	80	76	62	42	76
Bayer L13/59 Orally after $CuSO_4$ mouth swab*	4	115	48	91	70	32	73
Bephenium hydroxynaphthoate Ruminal injection	5	106	60	91	68	41	74
Bephenium hydroxynaphthoate Orally after $CuSO_4$ mouth swab	5	10	10	99	10	10	96

* One additional sheep in this group was accidentally treated orally without pre-swabbing with $CuSO_4$ solution. This sheep contained 200 immature 5th stage Ostertagia spp.

Statistical analysis of the results has been carried out using Student's "t" test for comparison of grouped data. In view of the large standard errors and variances inherent in data of this nature statistical significance is difficult to attain. It has, however, been attained in most of the more interesting comparisons emerging from these data.

Trial 1

The results with phenothiazine show that many more of both *Ostertagia* spp. and *T. axei* survived when it was administered into the abomasum than when it was injected into the rumen. The difference was significant ($P < .05$) in both cases. Anthelmintic efficiency was 78 per cent. against *Ostertagia* spp. and 91 per cent. against *T. axei* after dosing into the rumen ; oral administration after pre-swabbing with $CuSO_4$ resulted in only 26 and 22 per cent. reduction in worm burdens respectively.

Bephenium embonate was not usefully effective against either parasite by either mode of administration.

Bayer L13/59 was ineffective when given by injection into the rumen. However, it was 93 and 98 per cent. effective against *Ostertagia* spp. and *T. axei* respectively when given after swabbing with $CuSO_4$ to direct the drench into the abomasum. The difference between the 2 methods of administration was significant ($P < .05$) for both *Ostertagia* spp. and *T. axei*.

Trial 2

The results of this trial confirmed the higher efficiency of phenothiazine against both *Ostertagia* spp. and *T. axei* when injected into the rumen in contrast with the efficiency recorded when the preparation passed into the abomasum. This difference attained significance ($P < .01$) for both phenothiazine preparations against *T. axei*. Significance was not attained with *Ostertagia* spp. but the trend in this direction appeared evident especially for phenothiazine A.

Phenothiazine A was greatly superior to phenothiazine B against both parasites when administered into the rumen. This difference attained significance at $P < .01$ for *Ostertagia* spp. and $P < .05$ for *T. axei*.

Bayer L13/59 again exceeded 90 per cent. efficiency against both parasites when the drug reached the abomasum. Numerous parasites of both types remained in one sheep which was accidentally treated without premedication with $CuSO_4$, thereby confirming the lack of anthelmintic activity of the compound unless swallowed into the abomasum.

When given by ruminal injection Bayer 21/199 had no effect against *Ostertagia* spp. but was 85 per cent. effective against *T. axei*.

Bephenium hydroxynaphthoate was highly effective against *Ostertagia* spp. (98 per cent.) and *T. axei* (100 per cent.) when dosed to the abomasum. When given intra-ruminally the efficiency was reduced to nil for *Ostertagia* spp. and to 72 per cent for *T. axei*. The difference in the number of parasites present at autopsy was significant in both cases ($P < .05$).

When anthelmintic activity against immature *Ostertagia* spp. is considered it appears that a high degree of efficiency has been obtained with a number of the preparations but the high standard errors

resulted in many of the comparisons not attaining statistical significance.

The phenothiazine preparations appeared in general to be almost as effective against both early 5th stage and 4th stage *Ostertagia* spp. as they were against the adults. Again phenothiazine A tended to be superior to phenothiazine B but the difference failed to attain statistical significance.

Bayer L13/59 given orally after swabbing with $CuSO_4$ was highly effective against immature 5th stage *Ostertagia* spp. and somewhat less effective against the 4th stage worms.

When given by ruminal injection Bayer 21/199 was effective against both 4th and early 5th stages of *Ostertagia* spp. but was ineffective against the adults.

The activity of bephenium hydroxynaphthoate was similar to Bayer 21/199 against immature Ostertagia spp. when introduced into the rumen and was 91 per cent. effective against early 5th stages and 74 per cent effective against 4th stage *Ostertagia* spp. When given orally after swabbing with $CuSO_4$ activity increased to 99 and 96 per cent. against early 5th stages and 4th stage parasites.

Discussion

The trials reported here support unequivocally the claims that a " good " phenothiazine preparation is highly effective against the smaller abomasal trichostrongyles, *Ostertagia* spp. and *T. axei*.

It was pointed out in trial 2 that the quality of the phenothiazine preparation, other than particle size may be of great importance in determining anthelmintic efficiency. The two preparations tested in Trial 2 had very similar particle sizes, but their anthelmintic efficiencies differed considerably. This difference appeared to be more important with *Ostertagia* spp. than with *T. axei*. Even the less efficient preparation, phenothiazine B, removed 90 per cent. of the *T. axei* but still left significantly more adult worms in the abomasum than did phenothiazine A. No explanation is offered why *Ostertagia* spp. are much more sensitive than *T. axei* to changes in quality of the phenothiazine used. Forsyth (1960) has already indicated that efficiency against *Ostertagia* spp. was influenced by something other than purity and total dose area. It appeared that finer grinding increased the effectiveness to a greater degree than could be accounted for merely by virtue of the increase in surface area. Possibly smallness of particle size *per se* is important in treatment against *Ostertagia* spp.

The phenothiazine preparations used in Trial 2 had similar particle sizes—18,000 and 18,700 cm^2/gm. It would have been of great interest to compare the purity of the 2 preparations by a reliable technique, but unfortunately this was not possible. Baker *et al.* (1959) commenting on the lower anthelmintic efficiency of " N.F. phenothiazine " (U.S. National Formulary) compared with purified phenothiazine, stated that the former is claimed to contain 96 per cent. phenothiazine, which according to Forsyth (1960) should have been adequate for optimal anthelmintic efficiency. Baker *et al.* (1959) suggested as a possible explanation that the analytical technique for determining phenothiazine may not be adequate, and that other compounds are present in the N.F. phenothiazine which have no anthelmintic activity, but are recorded as phenothiazine. It seems not unlikely that this may have been the case with phenothiazine B in Trial 2. The chromatographic analysis technique mentioned by Forsyth (1960) if proved to be reliable, may solve this difficulty and enable a true and accurate assessment of the phenothiazine content of commercial " phenothiazine " formulations.

Phenothiazine of both types tested in these trials was markedly and significantly more efficient when administered by injection into the rumen than when given as an oral dose preceded by swabbing the mouth to induce reflex closure of the oesophageal groove. To our knowledge this peculiarity in behaviour of phenothiazine has not previously been reported. No other anthelmintic has been claimed to have a greater efficiency when swallowed into the rumen than when swallowed into the abomasum. Most of the older anthelmintics achieved success only if they were swallowed into the abomasum. Lazarus and Rogers (1953) and Esserman and Sambell (1953) presented evidence that phenothiazine entered the nematode *via* the cuticle. Douglas, Baker and Longhurst (1956) state that " it would seem logical to assume then that since phenothiazine is relatively insoluble in water, and probably also in digestive contents, its action on the worm is by direct solution from the solid state by the cuticle, similar to the phenomenon observed when many insects are exposed to solid insecticide particles." Possibly a relatively prolonged exposure of the worm to the drug is necessary to ensure absorption and lethal effects. When the drug is swallowed into the abomasum it may be passed on into the duodenum fairly quickly. This would give a very high concentration in the abomasum but only for a short time. When the drug is swallowed into the rumen it will be greatly diluted and low concentration will be maintained in ingesta passing through the abomasum for a relatively long period, probably several days. It is conceivable that this may be the reason for this peculiarity in the anthelmintic activity of phenothiazine.

It was most encouraging to note that phenothiazine A was more than 80 per cent. effective against early 5th stage *Ostertagia* spp. and 60 to 70 per cent. effective against the 4th stage. It was thought previously that the early stages of this parasite were likely to be particularly resistant to treatment. However, no information is yet forthcoming whether larvae lying dormant in the mucosa, as described by Sommerville (1953) are affected by anthelmintics. The very high efficiency attained by bephenium hydroxynaphthoate against 4th stage *Ostertagia* spp. when the drug passed into the abomasum suggests that the dormant larvae are vulnerable. Copp *et al.* (1958) in the original paper dealing with the bephenium salts claimed that these compounds appear to be more effective against mucosa dwelling nematodes than against those living in the lumen.

A comparison of the 2 trials shows that bephenium hydroxynaphthoate is very much superior to the embonate. When bephenium hydroxynaphthoate

was injected into the rumen it appeared to be effective against both immature 5th stage and against 4th stage *Ostertagia* spp. This may be related to their mucosa dwelling habit as mentioned above. A high degree of efficiency against adult *Ostertagia* spp. and *T. axei* was attained only when the drug was swallowed into the abomasum. Under these conditions the claims by Rawes and Scarnell (1959) for high efficiency against these species were confirmed.

The results with the organic phosphorus compounds do not agree with those reported by Herlich and Porter (1958) and by Stampa (1959). These authors claimed that Bayer 21/199 was effective in sheep against *Ostertagia* spp. and *T. axei* by oral drenching without the necessity for stimulating the oesophageal groove reflex. Gordon (1958b) had indicated a possible source of error when testing a drug by oral dosing to a relatively small group of sheep. Dosing sheep by this method allows the possibility of an unusually high percentage of sheep swallowing their dose via the oesophageal groove into the abomasum. This actually occurs normally in a proportion of animals. If, in the course of a test, an abnormally high percentage of sheep do swallow the drug into the abomasum, then an artificially high and erroneous value may be given to its anthelmintic efficiency. Variations of this nature may cause anomalous results. When it was desired that the drug should enter the rumen it was injected through the flank.

When swallowed into the abomasum Bayer L13/59 was highly efficient against all stages of *Ostertagia* spp. and against *T. axei*. When injected into the rumen some activity was observed against immature *Ostertagia* spp. but not against mature specimens of either of these parasites. When given by ruminal injection Bayer 21/199 was moderately effective against 5th stage and 4th stage *Ostertagia* spp., moderately effective against *T. axei*, but ineffective against adult *Ostertagia* spp. This drug was not tested by administration into the abomasum.

It appears that the organic phosphorus compounds and bephenium compounds have no advantage over phenothiazine for treatment against these parasites. With the ordinary drenching techniques a " good " phenothiazine preparation can attain maximal efficiency and will remove a very high proportion of adult *Ostertagia* spp. and *T. axei* and is moderately efficient against immature stages. Bephenium hydroxynaphthoate was more effective against immature *Ostertagia* spp. in the mucosa but only effective against adults if it was swallowed into the abomasum.

In all of the trials *Ostertagia* spp. were less susceptible to treatment than were *T. axei*. This is in agreement with the conclusions of Thomas and Elliott (1957) on the relative susceptibility of these 2 parasites.

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Current Literature

BOOKS RECEIVED

Diseases of Swine, edited by H. W. Dunne. Published in America by Iowa State University Press and in England by Baillière, Tindall and Cox, Ltd. 100s.

Principles and Methods of Animal Breeding, by R. B. Kelley, O.B.E., D.V.SC. Angus and Robertson Ltd. 42s.

Sheep Management and Diseases, by H. G. Belschner, D.V.SC., N.D.A. Angus and Robertson Ltd. 90s.

William Shakespeare and Robert Burton, by A. Brownlee, B.SC., M.R.C.V.S. A. Brownlee. Obtainable from R. L. Cook and Co., Booksellers, Old Burghclere, Newbury, Berks. 27s. 6d.

Report of the Agricultural Research Council for the year 1958-59. H.M.S.O. 9s.

The Artificial Insemination of Farm Animals, 3rd edition. Edited by Enos J. Perry. Rutgers University Press. $6.50.

R.C.V.S. Council Meeting

The quarterly meeting of the Council of the Royal College was held at 9 and 10, Red Lion Square, London, W.C.1, on May 27th. The President, Mr. J. N. Ritchie, C.B., presided.

He began by expressing his thanks for his re-election to the office of President for another year, and for the help he had had from colleagues and staff during the past year. He referred to two members in addition to the recent treasurer who were no longer members of Council—Mr. D. J. Brennan and Mr. H. M. Wilson. He hoped there would be occasions when they would again give the Council the benefit of their wisdom and experience, which had been of such great value. Mr. Ritchie then welcomed new members of Council: Mr. P. Harnett, from Ireland, Col. J. Hickman, Mr. J. M. Ingram, and Mr. A. Steele Bodger.

Obituary

Members stood in silence to the memory of those who had died since the previous meeting.

MISS J. O. JOSHUA made special mention of Miss Rosa Parker of Mill Hill, a member of the Supplementary Veterinary Register, whose work had been of a very high order and particularly appreciated over a wide area of North London. By her passing the Supplementary Veterinary Register had lost an outstanding member.

THE REGISTRAR (Mr W. G. R. Oates) supported Miss Joshua's tribute.

Correspondence

(a) THE REGISTRAR reported that the College would be represented at the fiftieth anniversary of the foundation of the Veterinary School at the University of Sydney by Professor R. M. C. Gunn.

(b) He reported also that the College had been invited to be represented at the 97th annual meeting of the American Veterinary Medical Association to be held in Denver, Colorado, August 15th to 18th, 1960.

Dr. David Luke would be attending and representing the B.V.A., and it was agreed that he be asked to represent the Royal College also.

(c) The Royal Society had drawn the attention of the Royal College to the fact that they are celebrating this year the tercentenary of their foundation, on Monday, July 18th, when their President and Officers would receive messages or congratulatory addresses from their fellow learned societies.

It was agreed to send a congratulatory message to the Royal Society.

(d) The Royal Agricultural Society of England had notified the R.C.V.S. of a new use for the Bledisloe Inter-County Dairy Herds Trophy, which in future would be awarded for outstanding work in the veterinary field, because its original purpose (to stimulate increase in the number of attested herds) had now been served. It would henceforward be awarded to persons who had made an effective contribution to animal health. The selection of suitable candidates would be by a joint committee comprising representatives of the R.C.V.S., the R.V.C. and the R.A.S.E. The trophy would not necessarily be awarded annually, but only as some meritorious contribution became apparent. A special medal would be struck for presentation to each recipient of the award.

It was resolved:

That the Council of the R.C.V.S. had received with gratification intimation that the R.A.S.E. has generously agreed to award the Bledisloe Trophy to persons who have made outstanding contributions in the veterinary field; and

That the Council has further agreed that the representatives of the R.C.V.S. on the Selection Committee to be set up by the R.A.S.E. should be Mr. H. W. Dawes and Mr. G. N. Gould.

Reports of Committees*

Examination and Education Committee

The Report laid before Council was as follows:—

The Committee had met on Thursday, May 26th, 1960.

Chairman

Professor H. G. Lamont was re-appointed.

Vice-Chairman

Professor J. G. Wright was re-appointed.

R.C.V.S. Trust

It was noted that the British Oil and Cake Mills Fellowship had been awarded to Mr. N. S. Ritchie, B.SC., who will pursue research in the general field of hypomagnesaemia at the Animal Husbandry Department of the Glasgow University Veterinary School.

F.A.O. Conference

The President referred to the report in THE VETERINARY RECORD and stated that the full report by FAO would be appearing shortly.

International League for the Protection of Horses

The Committee considered a letter from the International League for the Protection of Horses which included the following:—

"My colleagues and I are considering the possibility of donating a sum of money to promote a scholarship to enable a veterinary graduate to train as a specialist in equine work. I am asked to enquire whether you can make any suggestion as to the means by which this possibility can best be realised."

It was resolved that the President and Officers should take an early opportunity to discuss the matter further with the Society.

Arising out of discussion

It was resolved that a Committee should be set up by the President to make a preliminary study of the necessary intake and output of the veterinary schools in this country to meet the future demand for veterinary services at home and abroad.

PROFESSOR H. LAMONT, presenting the Report, mentioned a special meeting of the Committee held on May 26th to consider the Report of the Working Party on Veterinary Education in Under-developed Countries. This Report had been referred back to the Working Party to enable them to develop points of detail.

He asked that the Council should convey to the Working Party the thanks of the Examination and Education Committee for a very sound job of work.

* These reports have been abridged for publication.

Finance and General Purposes Committee

MR. A. J. WRIGHT presented the following Report:—

The Committee met on May 26th, 1960.

Chairman
Mr. A. J. Wright was elected.

Vice-Chairman
Dr. R. F. Montgomerie was elected.

Printing of College Publications
It was reported that since the last meeting of the Committee the College had received information about a further improved process for the keeping of records in list form which could be used for the printing of the Register. The Committee was given general information about this method and it was resolved that this matter should be deferred pending a full report on the various methods.

The Building Committee
It was noted that the meeting of the Building Committee had not taken place on May 25th, and it was reported that negotiations were still proceeding satisfactorily.

Mr. C. W. Francis
It was resolved that a suitable gift be made to Mr. Francis in recognition of his past services.

Annual General Meeting and R.C.V.S. Day, 1961
It was unanimously resolved that the Annual General Meeting and R.C.V.S. Day for 1961 should be held in Edinburgh.

Mr. Wright drew attention to the resolution that the Annual General Meeting and R.C.V.S. Day for 1961 should be held in Edinburgh. This was agreed.

The Chairman of the Building Committee, Professor L. P. Pugh, at the suggestion of the Chairman, gave a résumé of the work done in relation to the Royal College's sites and proposed new building.

Library Committee

The following Report was submitted:—

A Meeting of the Library Committee was held on May 26th, 1960.

Chairman
It was resolved (a) That Professor E. G. White be appointed chairman and Professor R. Lovell be appointed vice-chairman for the ensuing year.
(b) That Professor G. F. Boddie be warmly thanked for his valuable services as chairman for the past 10 years and for his great personal interest in all library affairs throughout that time.

Printed Catalogue Supplements
The second supplement to the Catalogue of Modern Works, covering the period 1957-8, was published in May. This has been printed as a supplement to THE VETERINARY RECORD through the kindness of the Editor.

PROFESSOR E. G. WHITE, presenting the Report, drew attention to the Committee's recorded thanks to Professor G. F. Boddie for his valuable services as Chairman for the past 10 years.

On the financial statement, the Committee had started the year with an adverse balance of £160 and had finished the year with a small credit balance: the Library was just making do on its existing budget.

The President emphasised the thanks of the Council and the Royal College to Professor Boddie for his work over the past ten years, for which they were all very grateful.

Parliamentary Committee

PROFESSOR W. L. WEIPERS introduced the following Report:—

The Parliamentary Committee met on May 26th, 1960.

Chairman
Professor W. L. Weipers was re-appointed.

Vice-Chairman
Dr. P. S. Pugh was appointed.

The P.D.S.A. and Section 7 Veterinary Surgeons Act, 1948
An interim report was received from Sir Laurence Watkinson and Mr. G. N. Gould. They were thanked for their services and it was noted that the scheme was extended to Newcastle, Cardiff and Watford.

Poultry
The following letter had been received from the Ministry of Agriculture, Fisheries and Food:—

"In Mr. Williams's letter of September 14th last he mentioned that the Agricultural Research Council had been asked to advise the Ministry as to whether the recommendation that antibiotics should not be used for laying poultry stock was still justifiable. This recommendation is contained in the Ministry's advisory leaflet No. 418, 'Antibiotics in Livestock Feeding,' issued in November, 1955.

"The Agricultural and Medical Research Councils are undertaking a comprehensive review of the whole situation in respect of the use of antibiotics in animal feeding and they have advised the Ministry that until the results of this review are available, it would be highly undesirable to recommend in the meantime any extension of the use of these substances.

"In the light of this advice, it is considered desirable that labels approved under the Therapeutic Substances Act, 1956, and Regulations should specifically state that supplements containing antibiotics should not be included in rations for laying poultry and that feeding-stuffs containing antibiotics should not be fed to such stock."

It was resolved that the Ministry be informed that the College approved of the action taken, pending the issue of the report of the Committee which had been set up by the A.R.C.

Animal Nurses
It was reported that the matter of the title had not yet been finally decided but following a request by the British Veterinary Association, it was agreed that a meeting should be held with the Association regarding the proposal for the commencement of the scheme of training.

Legislation Sub-Committee Proposals for New Veterinary Legislation
It was noted that a report of the working party on veterinary education in under-developed countries was to be considered by the Examination and Education Committee and it was agreed to consider the matter further in the light of any report to the Examination and Education Committee.

Meat Inspection Regulations—Scotland
A letter was received from Messrs. Hempsons advising on the legal aspect of the proposed Food (Meat Inspection) (Scotland) Regulations, 1960. It was resolved that the Chairman and Professor Robertson should meet representatives of the Department of Health for Scotland to discuss the proposed changes in meat regulations, and the Officers should have power to act on their advice.

(*Concluded at foot of page* 581)

News and Comment

VETERINARIAN'S WORK ON SHAKESPEARE

Mr. A. Brownlee is a veterinary surgeon and his book, "William Shakespeare and Robert Burton," is, in his words, a product of 9 years of spare-time study. In it he seeks to prove that not one but two writers contributed to the works usually attributed to Shakespeare and quotes extensive evidence in support of his thesis. The lesser poet, the author of the abundance of "purely physical and quite trivial detail," was, he believes, Will Shakespeare the actor respected as a playwright by most of his contemporaries; the greater poet, responsible for all the passages we learnt at school, was Robert Burton, Oxford scholar and author of "The Anatomy of Melancholy."

Whether or not one can agree with Mr. Brownlee's contention it is impossible not to admire the tremendous labour entailed in this work, and one's admiration is increased when one realises how often he has had the courage to defy established criticism. For example, Mr. Brownlee quotes Falstaff speeches from "King Henry IV" and "The Merry Wives of Windsor" to prove that they were written by different authors. His conclusion is that it is not the Falstaff of "The Merry Wives" that interests us to-day but he of "King Henry IV." Yet Auden has written* that his immediate reaction at a performance of "King Henry IV" is to wonder what Falstaff is doing in the play at all, and further that if it really was Queen Elizabeth who demanded to see Falstaff in a comedy, then she showed herself to be a very perceptive critic. It is dissension like this which serves to illuminate criticism.

It is indeed interesting that a member of our profession should be the author of a book such as this, and Mr. Brownlee is to be congratulated upon a notable feat of literary scholarship. His book is obtainable from R. L. Cook & Co., Old Burghclere, Newbury, Berks, price 27s. 6d.

* *Encounter*, November, 1959.

RETIREMENT OF MRS. K. MITCHELL

A meeting of over 200 students was held in the main hall of the Royal Veterinary College on June 23rd in honour of a presentation to Mrs. K. Mitchell on the occasion of her retirement from the office of Registrar of the College.

Mrs. Mitchell entered the meeting amidst tumultuous applause and was presented with a monumental bouquet, by Miss Susan Golding, President of the Women's Union.

Mr. John Bleby, President of the Students' Union Society, then related some details of Mrs. Mitchell's career. After leaving school, Mrs. Mitchell did so well at Pitman's College as a student that on completion of the course she was invited to stay on as a member of the staff. At the time of the declaration of the First World War she joined the secretarial staff of the Horse Guards and became secretary to Sir Francis Lloyd, General Officer Commanding the London Division. She was mentioned in dispatches for her fine work. She remained with Sir Francis until her marriage in the early 1920's.

After the death of her husband in 1939, Mrs. Mitchell successfully applied for the post of second

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R.C.V.S. Council Meeting.—*Concluded.*

Meat Inspection (England)

The Committee found that they could not agree that the new class of person being created in an effort to achieve 100 per cent. meat inspection should be allowed to seize meat. Commander Maitland volunteered, in his capacity as a member of Council nominated by the Privy Council, to make a direct approach to the Minister on this matter. It was resolved that the Ministry be informed of the Royal College's views.

Pet Animals Act, 1951

A proposal was noted that comprehensive conditions should be drafted which can be adopted by pet animal dealers and serve as a warranty for animals sold by them and that the matter had been sent to the British Veterinary Association.

MR. A. J. WRIGHT, referring to an item—Slaughter of Animals, Jewish and Mohammedan Methods—thought the R.C.V.S. should endorse the B.V.A.'s statement of policy.

PROFESSOR WEIPERS said this had not been discussed in Committee, but could be referred back for discussion if desired.

PROFESSOR J. G. WRIGHT thought evidence should first be called and considered; the College would be wrong in merely supporting an opinion formed on evidence heard, not by themselves, but by the B.V.A. They might still refer enquiries to the B.V.A. and their excellent report.

MR. G. ATKINSON, as chairman of the committee of the B.V.A. that had dealt with this matter, said it was not the opinion of the B.V.A. but of experienced members of the B.V.A. who worked in abattoirs and who had intimate knowledge of this method of slaughter. The expression of opinion had not been based on scientifically controlled experiments.

It was decided not to refer the matter back to the Parliamentary Committee.

PROFESSOR G. F. BODDIE thought there should be adequate mechanism for notifying members of changes in new statutory orders (*e.g.* pethedrine being brought under the Dangerous Drugs Act), possibly by publication in THE VETERINARY RECORD.

Honorary Associateship

THE PRESIDENT reported that the Diploma of Honorary Associateship had been presented to Dr. Rudolph Manninger on May 16th in the presence of the Hungarian Minister and other visitors, and he thanked the members of Council who had supported him on that occasion.

secretary to the Bursar of the College. She became in turn first secretary, private secretary to the late Professor Buxton, and finally Registrar.

In the latter position she had worked with devotion and had become a friend of all the students. She insisted on carrying on with her work even when confined to a hospital bed after a serious operation.

Mr. Bleby concluded, "I should like to say how proud we are to have known you and how pleasant it has been to work with such a charming lady. I can only say how sorry we are that you are leaving us, and whoever your successor may be, she will never fill the gap that you will leave."

Mrs. Mitchell was then presented with a silver tea service and an engraved hunting horn, given by past and present students.

In her reply to the President, Mrs Mitchell thanked everyone for the gifts made to her.

She hoped that students would visit her at her home in Brodfield, near Reading, and she looked forward to seeing the names of all those present in THE VETERINARY RECORD when they qualified.

"If I have been of the slightest use to any of you," she said, "it has given me the very greatest pleasure." In concluding the ceremony Mr. Bleby once again expressed the thanks of the students to Mrs. Mitchell and wished her every happiness in her retirement. The entire company then gave her a standing ovation.

BANKING FACILITIES AT CONGRESS

The Bank of Scotland has kindly agreed to provide banking facilities at the headquarters of Congress. Delegates who wish to be able to cash cheques at the branch bank should request their own banks to make the necessary credit arrangements with the parent office, Bank of Scotland, 711, Great Western Road. The credit instruction should be marked "British Veterinary Association Congress."

THE JOINT MEASUREMENT SCHEME

The pony "Tempest," belonging to Mr. J. G. Fielder of Firs Hill Court, Pool-in-Wharfedale, Yorkshire, was objected to at the Cheshire Agricultural Show under the rules of the Joint Measurement Scheme, and found to be 14.1¾ h.h. with its shoes removed. This objection was, therefore, overruled.

UNIVERSITY NEWS

Edinburgh

The undermentioned candidates have passed the Final Professional Examination for the degree of Bachelor of Veterinary Medicine and Surgery:—

Abbott, John Ewing Dixon, Allsup, Thomas Noel, Atkinson, William Ian, Campbell, Edward George, Dawson, Peter Stockdale, Downie, James Grant, Doxey, David Leonard, Eyre, Peter, Fairlie, George, Footman, Brian, Gill, Kenneth Alexander Kilgour, Goad, Lewis, Harcourt, Ralph Alexander, Irwin, Verney Christopher Robin, Jackson, Peter Giles Grenville, Macmillan, Elizabeth Gwendolene Moira, Mair, Malcolm Lamont, Middleton, Nigel Trevor (with Distinction), Moar, John Andy Edwin, Moore, Alexander, Oduro, Gottfried Abrokwa, Pratt, John Hay, Robson, Richard Peter, Rollo, David Gordon, Smith, Margaret Elizabeth, Somerville, John Ross, Spence, Albert Brown, Taylor, Stuart Macaulay, Thomas, Gruffydd Wyn, Tindall, John Richard, Vaughan-Birch, Allen, and Walton, John Roger.

The undermentioned candidates have passed in the subject of Chemistry of the First Professional Examination for the degree of Bachelor of Veterinary Medicine and Surgery:—

Agyekumhene, John K., Arije, Gabriel F., Baird, Ernest J., Baker, Dale, Baxendale, William, Bell, Andrew S. W., Blackhall, Kenneth M., Blenkhorn, George W., Brechin, Robert, Bywater, Robert J., Chavunduka, Dexter M., Clark, John C., Curry, Hugh W., Ewing, John M., Farrell, Janice M. F., Foster, Peter D., Harrison, Anthony W., Jackson, Norman J., McLauchlan, James A. S., Martin, John N. T., Mohamed, Saleh I., Noble, Frank, Ominiabohs, Florentus E., Pearce, Owen D., Rutter, James M., Thin, Ian M., Thomas, Philip J. P., Walker, Ronald, White, James N., Wood, Jean L., Woods, Joseph A., and Wrather, Peter A.

The undermentioned candidates have passed in the subject of Biology of the First Professional Examination for the B.V.M. & S. degree:—

Arije, Gabriel F., Baird, Ernest J., Beveridge, Alison M., Blackhall, Kenneth M., Blenkhorn, George W., Brown, Morag E., Bywater, Robert J., Cameron, James S., Cowgill, Michael G., Curry, Hugh W., Ewing, John M., Foster, Peter D., Galloway, Fiona H., Harrison, Anthony W., Jackson, Norman J., Lumsden, Malvern M., McLennan, Derek W., Martin, John N. T., Paton, Iain M. S., Pearce, Owen D., Poulsom, Michael J., Proctor, Gerald A., Rutter, James M., Shanks, Allan L., Thin, Ian M., Walker, Ronald, White, James N., Wood, Jean L., Woods, Joseph A., and Wrather, Peter A.

Glasgow

Degree of B.V.M.S.

FIRST PROFESSIONAL EXAMINATION

(a) CHEMISTRY

Anthony, F., Archer, M., Ballantine, A., Barth, Miss E. E., Bell, R., Campbell, W., Clarke, R., De La Mare, E., Duncan, J., Eckford, D., Esuruoso, G., Feldman, B., Gemmell, J., Hutton, R., Inglis, D., Jacobs, D., Jessiman, D., Kirk, I., Lyn, J., Maclean, A., Macleod, I., Miller, H., Nkrumah, S., Paterson, J., Robinson, C. (Distinction), Russell, A., Smith, N. (Distinction), Taylor, Miss J. A., Thaw, Miss E. M., Thomas, K., and Weipers, A.

(b) ZOOLOGY

Anthony, F., Archer, M. D., Ballantine, A. C., Barth, Miss E. E., Bilsborough, J., Campbell, W., Christie, E. H. L., Clarke, R., Duncan, A. L., Duncan, J. C., Eckford, D. A., Esuruoso, G., Gemmell, J., Haigh, J., Hutton, R., Inglis, D., Jacobs, D., Jessiman, D., Kirk, I., Lyn, J. (Distinction), McArthur, J., McDonald, S., Macleod, J., Miller, H., Nkrumah, S. (Distinction), Otty, C., Paterson, J., Richmond, S., Robinson, C., Russell, A., Smith, N., Stephens, J., Taylor, Miss J. A., Thomas, K., and Wingate, R. M.

(c) BOTANY

Anthony, F., Archer, M., Ballantine, A., Barth, Miss E., Bilsborough, J., Campbell, W., Clarke, R., Duncan, A., Eckford, D., Esuruoso, G., Gemmell, J., Heald, M., Hutton, R., Inglis, D., Jacobs, D., Kirk, A., Love, J., Lyn, J. (Distinction), McArthur, I., Macleod, I. (Distinction), Miller, H., Nkrumah, S., Otty, C., Richmond, S., Roberts, R., Robinson, C., Russell, A., Smith, N. (Distinction), and Taylor, Miss J. A.

MR. WALTER SCOTT

Mr. A. J. Skea writes:

It was with profound regret that we learned of the sudden death of Walter Scott, Divisional Veterinary Officer at Worcester, whose passing has cast a deep shadow over veterinary and agricultural circles in a wide area of the Midlands.

Having spent the past 25 years in Worcestershire, both as County Veterinary Officer, and Divisional Veterinary Officer for the Ministry of Agriculture, he had endeared himself to all with whom he came into contact by his cheerful nature, kind-heartedness, sympathetic treatment of the problems of others, and his complete integrity.

All Veterinary Offcers who have had the privilege of working with him under the trying conditions at foot-and-mouth disease centres will remember especially his initiative and resource. His enthusiasm in hastening the progress of bovine tuberculosis eradication in the county will long be remembered and appreciated.

The funeral service, which took place at Powick Parish Church, near Worcester, on June 29th, was attended by a very large number of mourners, including 40 members of the profession.

Our deepest sympathy is extended to his family, especially to his widow and two sons.

THE REGISTER OF VETERINARY SURGEONS

The following students of the Veterinary College of Ireland, having passed the Final Examination for the Diploma of M.R.C.V.S., were admitted to membership of the Royal College on the dates indicated:—

Crawford, Harrold Michael, Rowan Cottage, Stradbrook Road, Blackrock, Co. Dublin, June 30th, 1960; Flannery, Donald, 7-8, Pearse Street, Nenagh, Co. Tipperary, Eire, July 4th, 1960; Phelan, Nicholas Patrick, Listerlin, New Ross, Co. Kilkenny, Eire, June 30th, 1960; and White, James Edwin Charles, 26, Landenbridge Road, Sandymount, Dublin, Eire, June 30th, 1960.

The following ladies and gentlemen were admitted to membership of the Royal College of Veterinary Surgeons in virtue of the registrable degree of B.V.Sc. of the University of Bristol on July 6th, 1960:—

Anstey, Jean Mary, Coedygoras Farm, Penylan, Cardiff, Glam.; Blake, Kenneth John, School House, East Harptree, Bristol, Som.; Burrows, Charles John, 1, St. Paul's Place, Halliwell, Bolton, Lancs.; Davies, Hugh Emlyn, 100, Skip Lane, Walsall, Staffs.; Farman, Roy Samuel, Manor Farm, Mutford, Nr. Beccles, Suffolk; Jenkins, Charles Trevor, 37, Showell Lane, Penn, Nr. Wolverhampton, Staffs.; Morris, John Malcolm, Colly Uchaf Farm, Bedlinog, Nr. Treharris, Glam.; Peace, Michael David, The Grove, Wood End Lane, Fillongley, Nr. Coventry, Warwicks.; Perry, Michael David, Hunts Farm, Sherborne Causeway, Shaftesbury, Dorset; Roach, Michael John, 47, Canynge Road, Clifton, Bristol, 8, Som.; Sanders, Kenneth John, Saxtons, Lapford, Crediton, Devon; Sebesteny, Andor, c/o M. G. Halls, 11a, Priory Road, Clifton, Bristol, 8, Som.; Skelton, William Ewbank, Lowlands, Backwell, Nr. Bristol, Som.; Stoker, John William, 159, Cheam Road, Cheam, Surrey; Turner, Peter John, 39, Hazel Grove, Irby, Wirral, Cheshire; White, Keith Brian, 87, Union Road, Shirley, Solihull, Warwicks; Wilkinson, Keith Ronald, Southbrook, Lenten Street, Alton, Hants.; and Young, Robert Charles, 3, Martello Towers, Canford Cliffs, Bournemouth, Hants.

Under the provisions of Section 17 (2) of the Veterinary Surgeons Act, 1948, the name of Mr. James Bhattacharjee, 77, Lanthit, Insein, Burma, was restored to the Register of Veterinary Surgeons on July 5th, 1960.

The undermentioned gentlemen were entered on the Commonwealth List of the Register of Veterinary Surgeons on July 11th, 1960:—

Ketchell, Richard James, D.V.M. (TORONTO), 3206, Eglinton Avenue E., Scarborough, Ontario, Canada, and See, John Newlove, D.V.M. (TORONTO), Indian Line RR4, Malton, Ontario, Canada.

PERSONAL

Mr. W. B. Singleton, President of the British Small Animal Veterinary Association, recently visited the United States at the request of the American Animal Hospital Association. He visited a number of centres and gave papers to members of the American association. His visit ended with his attendance at the A.A.H.A. Annual Conference in Boston where he took an active part in discussions, presented papers, and appeared on closed-circuit television. Mr. Singleton has now been appointed an Associate Member of the A.A.H.A., and is the first British veterinary surgeon to be so elected.

Engagement

JONES—LAURSEN.—The engagement is announced between Alan Phillips Jones, B.V.M.S., M.R.C.V.S., only son of Mr. and Mrs. D. Jones of Neath, Glamorgan, and Grethe Kirsten Laursen, eldest daughter of Hrr and Fru E. Laursen of Søborg, Denmark.

Marriage

INGHAM—RUTHERFORD.—On July 2nd, 1960, at St. Mary's Church, Barnard Castle, Brian Ingham, B.V.M.S., M.R.C.V.S., of Newsome, Huddersfield, to Moira Rutherford of Barnard Castle.

Births

BRAZIER.—On July 2nd, 1960, to Gloria Diane (*née* Holmes), wife of John F. H. Brazier, M.R.C.V.S., of Chelmsley House, Cooks Lane, Tile Cross, Birmingham, Christopher John, a brother for Stephen.

COBBETT.—On June 24th, to Patricia, wife of B. H. Cobbett, M.R.C.V.S., of Bleets Farm, Feitham, Frome, Somerset, a daughter, Julia Colette.

KEEN.—On July 9th, 1960, at Marlow, to Pauline and Peter Keen, a daughter, Nicola, sister for Julia.

R.C.V.S. OBITUARY

Supplementary Veterinary Register

We record with regret the death of the following member of the profession:—

JONES, Frank Edward, 162, Ley Street, Ilford, Essex. Died July 7th, 1960, aged 59 years.

COMING EVENTS

July

26th (Tues.). Summer and Annual General Meeting of the Eastern Counties Veterinary Society at the B.O.C.M. Hobbs Cross Demonstration Farm, at 10.30 a.m.

29th (Fri.). Meeting of the Yorkshire Veterinary Society in the Royal Station Hotel, York, at 2.30 p.m.

August 28th to September 3rd. 78th Annual Congress of the British Veterinary Association in Glasgow.

B.V.A. COMMITTEE AND COUNCIL MEETINGS IN LONDON, JULY, 1960

Tuesday, July 19th, at 7, Mansfield Street

Finance Sub-Committee.

Wednesday, July 20th, at 7, Mansfield Street

10 a.m. Farm Livestock Committee.
11.30 a.m. Home Appointments Committee.
2.15 p.m. Veterinary State Medicine Committee.

Thursday, July 21st, at 7, Mansfield Street

10.30 a.m. Small Animals Committee.
12 noon Parliamentary and Public Relations Committee.
2.15 p.m. General Purposes and Finance Committee.

Friday, July 22nd

10.15 a.m. Council Meeting in the Great Hall of the Royal Veterinary College, Camden Town, N.W.1.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Ayr. Brae of Auchendrane (July 7).
Norfolk. Hall Farm, Little Fakenham, Thetford (July 11).

Fowl Pest

Cornwall. Wortha Farm, St. Neot, Liskeard (July 7).
Dorset. Black Horse Farm, Sturminster Marshall, Wimborne (July 7).
Salop. Acton Bank Farm, Brockton, Lydbury North, Bishops Castle (July 6).
Suffolk. Springfield, Raydon, Ipswich (July 8); Windyridge, Layham, Ipswich; Marquis of Cornwallis, Layham, Ipswich (July 10); 1, Waterworks Cottages, Raydon, Ipswich (July 11).

Swine Fever

Denbigh. Hollyberry Farm, Knolton Bryn, Overton, Wrexham (July 6).
Kent. Riding Lane Nurseries, Hildenborough; Swaylands Farm, The Mounts, Benenden, Cranbrook (July 11).
Lancs. Rimmer House, Bankhead Lane, Bamber Bridge, Preston; Chesham House Farm, Inskip, Preston (July 7); Hawks House Farm, Brierfield, Nelson (July 8); The Willows, Knutsford Road, Grappenhall, Warrington; Crow Tree Farm, Bleasdale, Garstang, Preston (July 11).
Lincs. Springfield Farm, Middle Rasen, Market Rasen (July 6).
Norfolk. Home Farm, Mattishall, Dereham (July 6); South Green Mattishall, Dereham; Littlemore Farm, Twyford, Dereham (July 11).
Somerset. Marsh, Lower Wiltown, Curry Rivel, Langport; Firepool Piggeries, Canal Lane, Taunton (July 11).
Staffs. Red Barn Farm, Fradswell (July 6).
Surrey. Pond Cottage, Whitmore Vale, Churt, Farnham (July 11).
Wilts. Middles Pond, Baydon, Marlborough (July 7).
Worcs. Goodyear Farm, Rectory Lane, Shawley (July 7).
Yorks. Whitehouse Farm, Shipton by Beningbrough (July 6); 59, Station Road, Royston, Barnsley (July 11).

Radiological Hazards in Veterinary Practice. TRAINOR, D. C., FOSKETT, W. E., & LARSEN, L. F. *Aust. Vet. J.* **36.** 8-13.

An article in the *Australian Veterinary Journal* (*Aust. Vet. J.* **36.** 8) describes radiological methods used in a number of veterinary practices, and the possible exposure of the operator to radiation has been estimated. The observations indicate that there is room for improvement in the methods used by some veterinary surgeons. Reference to the radiation readings taken at the University of Sydney shows that, where no protective clothing is used, the dosage to the skin (on the basis of 20 films per week) may easily be double the maximum safe exposure. It is recommended that a cone should always be used to keep the beam of rays to the smallest useful area; a suitable disc filter should always be used; protective clothing should be worn at all times; the animal should be anaesthetised, and not held, wherever possible; if sufficient staff are available they should work in rotation so that no one person gets too many exposures; the X-ray apparatus should be checked from time to time.

Letters to the Editor

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

Vaccination of Cattle with S.19

Sir,—I feel Dr. McDiarmid has been unfairly criticised. It is not he who has his "head in the clouds" but those who attack him. This attack is not only unwarranted but mis-directed; it is the Ministry who ought to be forced into action.

In 1957 Canada started an eradication plan; fortunately they have an excellent marking system and adult vaccination was not practised. Approved veterinarians vaccinate calves between 4 to 9 months and they are tagged at the time of vaccination with Government tags; a certificate is also provided.

The eradication itself was started in a few test areas, then extended to the counties, and later to the Provinces. Vaccinated animals are not tested until 3 years of age and even then are given a lenient reading. Reactors are slaughtered, compensation paid, premises cleaned, and retests carried out at 60 and 90 days. Within a year the eradication in Ontario was about complete.

We in Britain have been held up by the policy of indiscriminate vaccination and the failure of the Ministry to provide an adequate marking system for vaccinated calves.

If adult vaccination continues and eradication follows, those responsible, and their clients, will have one big headache. Now is the time for Ministry direction.

Yours faithfully,
LOUIS V. GOVAERTS.

31, Farley Hill,
Luton,
Bedfordshire.
July 4th, 1960.

"Veterinary Applied Pharmacology and Therapeutics"

Sir,—May I, through the courtesy of your correspondence columns, take the unusual step of commenting on the review of my book, which appears on pages 339 and 340 of your issue of July 2nd, 1960?

On the main point which your reviewer raises concerning the format of the book ". . . failure to adhere to the method of describing drugs under the various body systems," may I say that the method of *fully* describing a drug in one place only with relatively brief references elsewhere, follows the logical pattern used in teaching the subject for very many years, follows the prompting of my own experience, and was specifically requested by at least one other teacher of the subject in a British veterinary school.

I would also like to make the following points:—

1. There is a statement that "the author still adheres to the apothecaries' system of weights, though this has long since been officially discarded. . . ." The system was in fact discarded by the 1914 B.P., but we have all been brought up with it and the system is still used in both medical and veterinary prescribing, but especially dispensing: the student must, therefore, be familiar with the system. Further, the inference is that the apothecaries' system is used throughout the book: this is not so, for all dosages in the body of the book are expressed in the avoirdupois and/or metric systems. The apothecaries' system is referred to only in the chapters on prescribing and dispensing.

2. The reviewer states that there is no mention of the toxicological differences in bracken poisoning of horses and of cattle and yet on page 605 it is stated that bracken poisoning in horses is a pure aneurine deficiency and that "the condition in cattle is not one of pure thiamine deficiency." References are quoted. Further, the treatment which is the most effective in cattle is δι *b*atyl alcohol. The reviewer picks out an obvious printers' error, *b*utyl for *b*atyl, and comments "presumably di-butyl alcohol."

3. The statement that the reviewer has noted "some rather important omissions" also merits attention. The first drug quoted is diethyl carbamazine. At the time when the final copy was sent to press diethyl carbamazine had been displaced by its chemical parent piperazine. It was not until later (after final proofs had been cleared for press) that the results of field trials on its use in husk of calves were published.

The second is "oil of arachis." This preparation, officially styled arachis oil, is mentioned under Emollients, Fixed Oils, on pages 378 and 379.

The third, phenoxymethyl penicillin (Penicillin V), is mentioned in the section on the chemistry of the penicillins, page 454, in the section Absorption and Administration Routes, page 457, and occupies most of the paragraph on small-animal oral dosage of penicillin, page 470.

Finally, your reviewer says that ". . . the salts of bephenium" were also omitted. Bephenium embonate (this, the first salt, had only just been proved when we went to press) is referred to in the text on page 105 and appears under Anthelmintics, Strongyles, in both indexes.

Yours faithfully,
P. W. DAYKIN.

11, Cunningham Avenue,
St. Albans,
Herts.
July 5th, 1960.

General Anaesthesia in the Chinchilla

Sir,—Other members called upon to perform major surgery on the chinchilla may be interested to learn of the ease and safety with which general anaesthesia can be induced and maintained in this species by means of fluothane.

The "auto-inhalation" method described by Markowitz in "Experimental Surgery" serves admirably. A small Wright's type ether bottle, or a small wash bottle, connected to a suitable face-

piece is the only equipment required. An excellent mask can be made from a Higinson's enema syringe. The bulb of the syringe is divided transversely a little to one side of its equator. The larger portion forms the mask. The valve is cut away from the "tail" which is then attached to the outlet port of the bottle. Sufficient fluothane is used to bring its surface just below the mouth of the inlet port. Inspired air is thus drawn over the fluothane and carries with it enough vapour to produce anaesthesia.

Induction to surgical level requires half to one minute. Depth of anaesthesia is easily controlled by manipulation of the face-piece. Recovery takes place in 15 to 30 seconds from withdrawal of the mask.

Yours faithfully,
A. NOEL ORMROD.

Arrowe Park Road,
Woodchurch,
Wirral.
July 4th, 1960.

An R.A.V.C. Presentation

Sir,—I would be grateful if you would grant me the opportunity of recording in the columns of THE VETERINARY RECORD the retirement of Mr. J. D. G. Crisp, M.B.E., A.I.M.L.T., on August 27th, this year.

Mr. Crisp is, of course, well known for his loyal and meticulous work at the Royal Army Veterinary Corps Laboratory, Aldershot, since 1923. Prior to this he served in the R.A.V.C. during and after the First World War. He has given dedicated service to the veterinary officer in the field and there must hardly be an officer who has not benefited by his skill. His services will be missed by his friends in the R.A.V.C. throughout the world and there must be many who have sometime been associated with the R.A.V.C. who have reason to remember him with gratitude.

As a Senior Assistant (Scientific) he gained wide recognition amongst his own professional associates and throughout the years has imparted his knowledge and skill in many fields of veterinary work. I am confident that there will be many who will desire to associate themselves with a token of appreciation for all his work. For this purpose I have opened a presentation fund. Donations should be sent (by September 1st, please) to Major H. W. Bishop, R.A.V.C., R.A.V.C. School and Stores, Aldershot, Hants.

It will be helpful if cheques could be made out to "R.A.V.C. Presentation Fund."

Yours faithfully,
J. CLABBY.

The War Office,
Droitwich,
Worcs.
July 8th, 1960.

Inoculation Against Distemper

Sir,—With reference to Mr. H. E. Carter's letter in your issue of June 18th, although the answers to his questions have been repeatedly mentioned in various publications, I feel that a straight answer would be justifiable in the circumstances. I am speaking only on behalf of our own preparations.

1. What is the duration of immunity produced by the various vaccines now on the market?

Dogs which I vaccinated as early as 1952, while working at the Central Veterinary Laboratory, Weybridge, are still enjoying a natural life. Some of these dogs belonged to various private owners, and others were maintained under strict laboratory observation (full experimental conditions). In none of these was there any breakdown of immunity apart from one case which was vaccinated at 9 weeks of age. These dogs represented a varied section of the dog population, *i.e.* kennels, flats and houses in town and country, and they were exposed to everyday natural infection.

2. What booster injections are necessary?

It is my personal opinion that a dog which has received the egg-adapted distemper vaccine by inoculation and the hepatitis vaccine by instillation requires no further booster injections unless that animal has been kept isolated from all other dogs (under unnatural conditions). In this case a booster dose with the distemper vaccine is advantageous, 2 years after vaccination.

3. What is the optimum age for inoculation?

My experience has shown that dogs under 10 weeks old do not respond well to vaccination. It is a critical period and may well result in lack of protection in months to come. I have found that 10 to 12 weeks old is the best age to develop good immunity.

4. What are the facts concerning the possibility of a virus interference effect when using a distemper/hepatitis combined vaccine with live viruses?

There is no interference between one virus and another in producing its immunological response. The distemper virus is epithelio-tropic and the hepatitis virus is endothelio-tropic. The incubation periods of the 2 viruses are different and the immune response is also different. With distemper, the antibody response as demonstrated by complement fixation and Gel diffusion precipitin tests, will only be present following an active but not fatal infection and last for about 5 weeks, whereas in hepatitis this response lasts for up to 3 years, as has been reported on previous occasions. Thus there is no doubt that the 2 viruses have no interference against each other but, on the contrary, have a synergetic effect. Both live virulent viruses are more lethal if combined, as indicated by Gillespie *et al.* (1952), and when used as a vaccine produce much stronger immunity, as demonstrated by myself and reported on various occasions.

5. What are the relative merits of egg-adapted distemper virus vaccines, taking account of the fact that all bar one are from the same source?

These are dependent on the method of preparation and preservation.

6. What are the relative merits of hepatitis vaccines, *i.e.* between live vaccines of dog or ferret origin, or killed vaccines?

The live hepatitis virus vaccine, as produced by this laboratory and used as an oculentum, provides (1) an immunising agent and (2) a test to indicate whether the animal is immune or not at the time of instillation, thus giving evidence of the result of the vaccination.

7. What are the potencies of your vaccines as sold, and why are these not stated on the containers?

It is assumed that a vaccine issued from a reputable laboratory should fulfil certain requirements, the most important of which is to protect the animal which is going to receive it against the agent from which it is prepared. The expiry date on each batch would certainly indicate that the potency of such vaccine after that date is not valid.

8. What are the "shelf lives" of these vaccines?

See answer to previous question.

9. Does live hepatitis vaccine of canine origin cause carriers and increase the spread of disease, and if so is live virus of ferret origin any better?

In October, 1955, there was a Canine Virus Forum held at the Royal Veterinary College, and as a member of that forum I expressed the opinion that to produce a known carrier is one of the very rare conditions. Up to that date I had not found one and, furthermore, up to this day I am still of the same opinion. There was a suggestion that this infection could be "carried over" in heavily populated kennels. If immunisation is directed towards the protection of all dogs of all ages whenever possible, the chance of spreading infection would be of no importance. In this case I would agree with Mr. Coryn that a campaign towards immunisation of dogs against distemper and hepatitis should have the blessing of the B.V.A. No doubt mass vaccination against any infection would control such a disease in the shortest possible time.

10. What is the incidence of unwanted sequelae to vaccination, *e.g.* "blue eye" following hepatitis vaccination with live virus?

The incidence of "blue eye" following our method of vaccination is very rare indeed. On the other hand, marked eyelid reaction will occur in less than 10 per cent. of the very highly susceptible animals.

11. What is the incidence of breakdown following vaccination?

This question can be answered in 2 parts.

(a) The development of disease immediately after vaccination, with special reference to canine distemper complex. It is well known that an animal which develops clinical symptoms of the visceral type within a fortnight of vaccination, or nervous symptoms within 5 weeks of vaccination, has been vaccinated while in the incubation period. This does not apply only to our preparations, but to others as well. This in fact is not a breakdown of vaccination and should not be taken as such. Since 1952 I have come across 2 such cases.

(b) A true breakdown in immunisation should be limited to cases in which protection against a disease was not accomplished after the above-mentioned periods. What will contribute towards breakdown of immunity is (a) immunisation at an early age, *i.e.* less than 10 weeks, (b) strict isolation of the vaccinated animal for over 2 years, and (c) the vaccine not being viable at the time of use. Since 1952 I have had only one case under (a), and none at all under (b) and (c).

I would welcome any enquiries in relation to these virus infections, and there will be no "brushing aside" of any member who wishes to enquire.

Yours faithfully,
W. MANSI.

Mansi Laboratories Limited,
Herons Way,
Wey Road,
Weybridge,
Surrey.

July 7th, 1960.

Reference

GILLESPIE, J. H., ROBINSON, J. I., & BAKER, J. A. (1952). *Proc. Soc. Exp. Biol. N.Y.* **81**. 461.

Simultaneous Presentation of Twin Lambs

Sir,—Mr. T. Hughes Ellis in his "Observations on Some Aspects of Obstetrics in the Ewe" (*Vet. Rec.* **70**. 952) made an admirable effort to arouse veterinary interest in Britain in this subject. But except the caesarean operation, for which Australia on the whole is not economically ready, there is little in his paper with which leading Australian stud sheep breeders are unfamiliar. We need to go far beyond his observations to qualify as leaders of thought and action in ovine obstetrics here.

There is space for just one proof of the truth of this statement. Under the heading "Twins" on page 956 of his article Ellis states that in a 10-year period "no special difficulty was experienced on account of twins. One twin always followed the other without parts of both being actually presented simultaneously."

This finding is completely opposed to Australian experience where, at least in Tasmania, simultaneously fore-presenting twin lambs are a common cause of loss to the breeder and suffering to the ewe. Within a dozen miles of my surgery, and included in my practice, there are more than 25 registered breeders of pure-bred sheep comprising Leicester, both Border and English, Southdown, Ryeland, Romney, Dorset, both Horned and Poll, Cheviot, Polwarth and Corriedale.

Such a large collection of famous studs of many different breeds in so small an area is unique in Australia and perhaps in the whole world. Most of the breeders also run a flock of cross-breds for fat lamb and wool production, the total number of sheep in the district exceeding 200,000.

A canvass of the breeders has revealed that all are familiar with that form of dystocia where 2 fore-presenting lambs are tangled together at the same level in the uterus, struggling simultaneously to enter or get through a too narrow pelvic canal while the ewe strains hard and often. All more or less dread the condition, and only a few claim a limited ability to deal with it. Of all the breeds only the Cheviot seems wholly immune. Estimates by Tasmanian breeders of the incidence of this form of dystocia vary from one ewe in 500 to 1 per cent. of the breeding flock in some seasons.

Clinical Cases

In the last fortnight of September, 1959, four cases were submitted for treatment. A brief description should show how inapplicable the findings of Ellis in England are to this condition in Tasmania.

Case 1. A young Southdown ewe was brought to the surgery with a history that the head of one of 2 simultaneously presenting lambs had been got out but had slipped back during an attempt to bring up one foreleg, and that now no heads at all could be located.

Examination soon confirmed the absence of heads, but 2 hind legs were found and secured for traction. When the dead lamb was pulled it emerged with the small intestine of the ewe coiled tightly around its neck. Obviously both heads had passed together into the abdominal cavity through a ruptured uterine wall.

Case 2. A Border Leicester ewe was presenting twin lambs simultaneously and the experienced breeder had been trying in vain for some time to deliver a live lamb. On arrival at the farm it was found that there had been too much haemorrhage to make survival likely: but the ewe had been in the champion class and the owner insisted on my trying to save her, or a lamb, or both.

One dying lamb was delivered by the vulsellum forceps fixed to the upper jaw, and a second lamb was just delivered when the ewe collapsed and died.

Case 3. Again I was called to a farm where an experienced breeder had been trying for some time without success to identify and secure the head and forelegs of one of 2 simultaneously presenting lambs. The ewe, a Border Leicester, was heavy and straining both violently and continuously. It was quite impossible to repel one lamb long enough to secure and pull the other. As fast as one repels one lamb in such cases the ewe strains and drives it back again. When, at last, the vulsellum forceps was firmly fixed to the upper jaw of one lamb traction failed to move it, probably due to obstruction by the other lamb. Consequently, the head of one lamb was amputated by the wire embryotome making it possible to identify and cord up the forelegs belonging to the headless trunk. The greater traction force thus obtained effected delivery, after which delivery of the second lamb was fairly easy. But the second lamb was dead and the ewe died 2 days later.

Case 4. After calving a cow one was asked on the same farm to lamb a Southdown ewe belonging to the owner of Case No. 1 who had been warned to leave the next case alone if he expected good results from veterinary aid.

He had done so, and for the first time in this series one had a really fresh case in which the chance of survival had not been jeopardised by haemorrhage due to rough handling.

By means of the vulsellum forceps a firm grip was taken of the upper jaw of one of the 2 simultaneously presenting lambs. Then, very slowly and carefully, after much lubrication, the friction or obstruction of the other lamb was overcome and the head of a live foetus was brought safely out. A hand passed down beside the neck secured and brought up a foreleg and the entire lamb was soon delivered.

Owing to a narrow pelvic canal the vulsellum forceps had also to be used to effect extraction of the other lamb in the same way, and so, for the first time in this series, we had both a live ewe and 2 live lambs.

Yours faithfully,
J. W. RAINEY.

P.O. Box 67,
Westbury,
Tasmania.
July 7th, 1960.

Cystic Calculus in the Cat

Sir,—With reference to the article on "Cystic Calculus in the Cat" by Mr. J. Jarvis, I would like to cite the following case which I recently saw in a 3-month-old entire male kitten.

The animal was brought for euthanasia with a history of a greatly enlarged abdomen for the last 6 weeks but with no other symptoms. There was some difficulty in walking with such a pendulous abdomen and this was the reason given for requesting euthanasia.

On *post-mortem* examination the bladder was found to occupy the whole of the abdominal cavity, the mucosa being greatly hypertrophied and hyperaemic. About a teaspoonful of small stellate crystals was present towards the neck of the bladder.

The case appears to be of some interest with regard to the age of the animal and the relative absence of symptoms.

Yours faithfully,
A. P. JONES.

23, Ravensbourne Gardens,
London, W.13.
July 10th, 1960.

DISEASES OF ANIMALS ACT, 1950—GREAT BRITAIN
Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period		Anthrax	Atrophic Rhinitis	Foot-and-Mouth	Fowl Pest	Sheep Scab	Swine Fever
1st to 15th May, 1960		9	—	3	92	—	37
Corresponding period in	1959	6	—	5	17	—	40
	1958	10	—	—	17	—	48
	1957	16	1	1	31	—	31
1st Jan. to 15th May, 1960		111	—	14	1,177	—	398
Corresponding period in	1959	104	—	7	311	—	430
	1958	77	3	110	259	—	409
	1957	192	3	16	323	—	307